Federal Communications Commission
Washington, D.C. 20554

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Small Entity Compliance Guide

Part 15 TV Band Devices

Second Report and Order and Memorandum Opinion and Order
FCC 08-260
ET Docket No. 04-186
Released November 14, 2008

This Guide is prepared in accordance with the requirements of Section 212 of the Small Business Regulatory Enforcement Fairness Act of 1996. It is intended to help small entities—small businesses, small organizations (non-profits), and small governmental jurisdictions—to comply with the new rule/s adopted in the above-referenced FCC rulemaking docket. This Guide is not intended to replace the rule/s and, therefore, final authority rests solely with the rule/s. Although we have attempted to cover all parts of the rule/s that might be especially important to small entities, the coverage may not be exhaustive. As a result, in any civil or administrative action against a small entity for a violation of a rule or rules, the content of the Small Entity Compliance Guide may be considered only as evidence of the reasonableness or appropriateness of proposed fines, penalties or damages. This Guide may not apply in a particular situation based upon the circumstances, and the FCC retains the discretion to adopt approaches on a case-by-case basis that may differ from this Guide, where appropriate. Any decisions regarding a particular small entity will be based on the statute and regulations. Interested parties are free to file comments regarding this Guide and the appropriateness of its application to a particular situation; the FCC will consider whether the recommendations or interpretations in the Guide are appropriate in that situation. The FCC may decide to revise this Guide without public notice to reflect changes in the FCC's approach to implementing a rule, or to clarify or update text. Direct your comments and recommendations, or calls for further assistance, to the FCC's Consumer Center:

1-888-CALL-FCC (1-888-225-5322)

TTY: 1-888-TELL-FCC (1-888-835-5322)

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Fax: 202-418-0232

Part 15 TV Band Device Compliance Requirements

1. Objectives of the Proceeding

In the *Second Report and Order and Memorandum Opinion and Order* in this proceeding, the Commission adopted rules to allow unlicensed radio transmitters to operate in the broadcast television spectrum at locations where that spectrum is not being used by licensed services. This unused TV spectrum is often termed "white spaces." The devices that operate under these rules are called TV band devices or TVBDs. The FCC's actions in this proceeding made a significant amount of spectrum available for new and innovative products and services, including broadband data and other services for businesses and consumers. The rules adopted include many safeguards to prevent harmful interference to incumbent communications services. Moreover, the FCC will closely oversee the development and introduction of these devices to the market and will take whatever actions may be necessary to avoid, and if necessary correct, any interference that may occur. Further, the FCC will consider in the future any changes to the rules that may be appropriate to provide greater flexibility for development of this technology and better protect against harmful interference to incumbent communications services.

A copy of the *Second Report and Order and Memorandum Opinion and Order* is available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.pdf (23 FCC Rcd 16807 (2008)

2. General Information

Part 15 of the FCC rules contains the technical requirements for radio frequency devices that may be operated without an individual license. The requirements include radiated and power line conducted emission limits for intentional and unintentional radiators.

Examples of Part 15 intentional radiators include cordless telephones, remote control transmitters, remote utility meter readers, and wireless local area networking equipment. Part 15 intentional radiators must be certified by the FCC or a designated Telecommunication Certification Body (TCB) before they can be imported into or marketed within the United States.

Examples of Part 15 unintentional radiators include radio receivers, computers and TV interface devices such as DVD players, cable and satellite boxes. Most unintentional radiators can be authorized through a self-approval process in which the manufacturer has the equipment tested to ensure it complies with the rules, but does not have to obtain certification through the FCC or a TCB. However, scanning receivers and radar detectors are required to be certified before they can be imported into or marketed within the United States.

3. What is a TV band device?

A TV band device (TVBD) is a low power transmitter that operates on an unoccupied TV channel in the range of channels 2-51, excluding channels 3-4 and 37. There are two categories of TV band devices: fixed and personal/portable.

4. What is a fixed TVBD?

A fixed TVBD transmits and receives at a specified fixed location. Fixed TVBDs can be used to provide services such as wireless broadband access in urban and rural area.

5. What is a personal/portable TVBD?

A personal/portable TVBD transmits and receives while in motion or at unspecified locations. Personal/portable TVBDs can take the form of devices such as Wi-Fi-like cards in laptop computers or wireless in-home local area networks.

6. What types of operation are permitted for personal/portable TVBDs?

There are three types of operation permitted for personal/portable TVBD. A single device could be capable of more than one type of operation.

1) Mode I operation: the TVBD operates under the control of a fixed or Mode II TVBD that determines the available TV channels at a particular location.
2) Mode II operation: the TVBD must be capable of determining the available channels at its location using geo-location and database access.
3) Sensing-only operation: the TVBD uses spectrum sensing and does not rely on geo-location/database access or another device to determine available channels.

7. What are the requirements that apply to all TVBDs?

- A TVBD must incorporate transmit power control and limit the operating power to the minimum necessary for successful communication. A description of the transmit power control mechanism must be submitted with the application for certification.
- A TVBD must incorporate spectrum sensing capabilities that can detect TV and wireless microphone signals.
- A TVBD must have the capability to display a list of identified available channels and its operating channel.
- A TVBD must comply with the RF safety requirements of Section 15.709(d).
- Out-of-band emissions must comply with the limits in Section 15.709(c).
- The instruction manual must contain the statement shown in Section 15.706(a) that advises of the potential for a TVBD to cause interference to TV reception and lists possible measures to correct any interference that does occur.

8. What are the requirements that apply to fixed TVBDs?

- Operation is permitted on TV channels 2-51, excluding channels 3-4 and 37.
- The maximum transmit power may not exceed one watt.
    - If the maximum transmit antenna gain exceeds 6 dBi, the transmit power must be reduced by the amount in dB that the maximum gain exceeds 6 dBi.
- The transmit antenna may not be more than 30 meters above ground.
- The receive antenna used for spectrum sensing must be located outdoors and at least 10 meters above ground.

- The TVBD must incorporate geo-location capabilities to determine its geographic coordinates to an accuracy of +/-50 meters. Alternatively, the device may be professionally installed by a party that determines the device's geographic coordinates and programs them into the device.
- The TVBD must be capable accessing a database over the Internet that will provide a list of available TV channels at its geographic coordinates.
    - It must submit registration information when it initially accesses the database.
    - It may operate only on TV channels that the database indicates are available.
    - It must access the database at least once a day to verify that the operating channel continues to remain available, and operation must cease if the channel is no longer available.
    - If the database can not be contacted during any given day, the TVBD may continue to operate until 11:59 PM on the following day at which time it must cease operation if it still has not contacted the database.
- The TVBD must transmit identification information that conforms to a recognized industry standard and contains sufficient information to identify the device and its geographic coordinates.

9. What are the requirements that apply to personal/portable TVBDs?

- Operation is permitted on TV channels 21-51, excluding channel 37.
- The maximum transmit power may not exceed 100 milliwatts, except:
    - The maximum transmit power of TVBDs operating at less than the required separation distances from adjacent channel TV stations may not exceed 40 milliwatts.
    - Sensing-only TVBDs are limited to 50 milliwatts.
    - If the maximum transmit antenna gain exceeds 0 dBi, the transmit power must be reduced by the amount in dB that the gain exceeds 0 dBi.
- The transmit antenna must be permanently attached.

10. What are the requirements specific to Mode I personal/portable TVBDs?

- The TVBD must operate as a client to either a fixed TVBD or a Mode II personal/portable TVBD that acts as the master device.
    - It may only transmit upon receiving transmissions from the master device.
    - It may transmit on either an operating channel of the master device or on a channel that the master device indicates is available for use.

11. What are the requirements specific to Mode II personal portable TVBDs?

- The TVBD must incorporate a geo-location capability to determine its geographic coordinates to an accuracy of +/- 50 meters. It must re-establish its position each time it is activated from a power-off condition.
- The TVBD must access a database over the Internet to determine the TV channels that are available at its geographic coordinates prior to the initial service transmission at a given location.
    - The TVBD must provide its FCC identifier, manufacturer's serial number and geographic coordinates to the database.

- Operation is permitted only on channels that are indicated in the database as being available for TVBDs.
- The TVBD must access the database for a list of available channels each time it is activated from a power-off condition and re-check its location and the database for available channels if it changes location during operation.
- A TVBD that has been in a powered state shall re-check its location and access the database daily to verify that the operating channel(s) continue to be available.
- If the database cannot be contacted during any given day, the TVBD may continue to operate until 11:59 PM on the following day at which time it must cease operation if it still has not contacted the database.

12. What is the TVBD database?

The TVBD database will be a privately owned and operated service that fixed and Mode II TVBDs must contact to obtain information on channel availability at the locations where they are operated and, in the case of fixed devices, to register their operation at those locations. The FCC will designate one or more database administrators from the private sector to create and operate a TVBD database or databases. Database administrators may charge fees for the provision of lists of available channels to TVBDs and for the registration of fixed TVBDs and temporary broadcast auxiliary links. A TVBD database will be required to contain information including:

- Records for stations in all of the authorized services that operate in the TV bands using fixed transmitters with designated service areas, including full service and low power TV stations.
- The service paths of broadcast auxiliary point-to-point facilities.
- The geographic regions served by private land mobile and commercial mobile radio service operations on channels 14-20.
- Regions served by the Offshore Radiotelephone Service.
- The locations of cable headends and low power TV receive sites that are outside the protected contours of the TV stations whose signals they receive.
- The locations of registered sites where wireless microphones and other low power auxiliary devices are used on a regular or scheduled basis.
- Registration information for fixed TVBDs.

13. What are the spectrum sensing capabilities and requirements for both fixed and personal/portable TVBDs?

- All fixed and personal/portable TVBDs must be capable of detecting digital TV signals, analog TV signals, and both analog and digital wireless microphone signals at the following levels:
  - Digital TV signals: -114 dBm, averaged over a 6 MHz bandwidth
  - Analog TV signals: -114 dBm, averaged over a 100 kHz bandwidth
  - Wireless microphone signals: -114 dBm, averaged over a 200 KHz bandwidth
- The detection thresholds are referenced to an omnidirectional receive antenna with a gain of 0 dBi.

    - If a receive antenna with a minimum directional gain of less than 0 dBi is used, the detection threshold must be reduced by the amount in dB that the minimum directional gain of the antenna is less than 0 dBi.
    - Alternative approaches for a sensing antenna are permitted, such as electronically rotatable antennas, provided the applicant for equipment authorization can demonstrate that they provide at least the same performance as an omnidirectional antenna with a gain of 0 dBi.
- A TVBD may begin operating on a TV channel if no wireless microphones or other low power auxiliary devices are detected within a minimum time interval of 30 seconds.
- A TVBD must check for analog and digital TV signals for a minimum time interval of 30 seconds. If a TV signal is detected on a channel indicated as available by the database, the device must provide an indication of that detection to the operator of the device and provide a means for the operator to optionally remove that channel from the list of available channels.
- A TVBD must provide in-service monitoring of an operating channel at a minimum of once every 60 seconds.
- After a wireless microphone or other low power auxiliary device signal is detected on an operating channel, all transmissions on that channel must cease within two seconds.
- Personal/portable TVBDs operating in Mode I must identify those television channels on which it senses signals above the detection threshold to the fixed or Mode II personal/portable TVBD that is acting as the master device. The fixed or Mode II TVBD must respond as if it had detected the signal itself.
- Fixed and personal/portable TVBDs communicating either directly with one another or linked through a base station must share information on channel occupancy determined by sensing. If any TVBD in a local area group or network determines that a channel is occupied, all other linked TVBDs will also be required to respond as if they had detected the signal themselves.

14. <u>What are the approval requirements for TVBDs?</u>

TVBDs must be certified by the FCC before they can be imported into or marketed within the United States. Telecommunications Certification Bodies (TCBs) will not be permitted to certify TVBDs until the FCC has more experience with them and can properly advise TCBs on how to apply the applicable rules. Sensing-only TVBDs have additional approval requirements that are listed below. Please refer to 47 C.F.R. § 15.701, *et. seq.* for detailed information on the TVBD approval requirements and 47 C.F.R. § 2.901, *et. seq.* for information on the equipment certification procedures.

15. <u>What are the approval requirements for sensing-only TVBDS?</u>

- Sensing-only TVBDs must demonstrate with an extremely high degree of confidence that they will not cause harmful interference to incumbent radio services.
- The device must meet the requirements for personal/portable devices except that it will be limited to a maximum EIRP of 50 milliwatts and does not have to comply with the requirements for geo-location and database access.
- Compliance with the detection threshold for spectrum sensing is required, but not necessarily sufficient, for demonstrating reliable interference avoidance.

- Once a device is certified, additional devices that are identical in electrical characteristics and antenna systems may be certified under the standard equipment authorization procedures.
- The following equipment authorization requirements apply in addition to the requirements in Part 2 of the rules:
    - The application must include a full explanation of how the device will protect incumbent authorized services against interference.
    - A pre-production device, identical to the device expected to be marketed, must be submitted to the FCC for testing.
- Applications for sensing-only TVBDs will be processed as follows:
    - Applications will be placed on Public Notice for a minimum of 30 days for comments and 15 days for reply comments. The Public Notice will include proposed test procedures and methodologies.
    - The Commission will conduct laboratory and field tests of the pre-production device which will be open to the public. This testing will be conducted to evaluate proof of performance of the device, including characterization of its sensing capability and its interference potential.
    - After the completion of testing, the Commission will issue by Public Notice, a test report including recommendations. The Public Notice will provide at least 30 days for comments and, if any objections are received, an additional 15 days for reply comments.
    - The decision on whether to certify a device that relies solely on spectrum sensing will be made by the full Commission.

16. What if I have questions on the TVBD rules?

The FCC maintains a web based system that is used to submit inquiries to its Laboratory, as well as to search for previous rule interpretations and frequently asked questions. This system, called the OET Knowledge DataBase (KDB), can be accessed at www.fcc.gov/labhelp.

17. Where can I find documents about the TVBD certification rules?

FCC order adopting TVBD rules: *Second Report and Order and Memorandum Opinion and Order* in ET Docket No. 04-186, FCC 08-260, released November 14, 2008, 23 FCC Rcd 16807 (2008)
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.doc (Word)
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.pdf (Acrobat)
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.txt (Text)

Equipment authorization information:
http://www.fcc.gov/oet/ea/